



The Effectiveness of Using Some Ipad Applications to Reduce Dyscalculia Among A Sample of Students with Learning Disabilities in Rafha Province

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ABSTRACT

Background: Assistive technology has become a tool that enhances the ability of students with dyscalculia, so designing multiple sessions in some iPad applications can help reduce dyscalculia. Aims: this study was designed to investigate the effect of using some iPad apps to reduce dyscalculia. Setting: a primary school in Rafha, Saudi Arabia. Methods: out of 60 students in many schools in Rafha province, 38 students were identified as the final sample and 9.6 years were identified as the average age using standard and valid scales. The quasi-experimental method has been used to divide these students into two groups. First, an experimental group of 19 students received 28 sessions of 40 minutes four times a week. Second, a control group of 19 students who received a class program during the regular school day. This program lasted for seven weeks. Results: The study concluded that the program is effective in reducing dyscalculia. Conclusion: In this study, the efficacy of the program's in reducing dyscalculia was studied using the iPad. The sessions included a range of exercises and tasks aimed at recognizing and using mathematical symbols.

Keywords: Assistive technology, Dyscalculia, IPad, learning disabilities, Rafh.

INTRODUCTION

Community development can be driven by the programs and services that provide in education, especially for those with learning disabilities. Students with learning disabilities who have an average or above-average IQS can make progress in their abilities and capabilities when they are offered modern technology education (Bou et al., 2016; Ghanatpisheh et al., 2019). Dyscalculia is a disorder of the ability to learn mathematical concepts or perform the relevant operations of addition, subtraction, multiplication, and division, in addition to the problems built on them in the study of fractions, algebra, and geometry that are to come later (Hafiz 2008). Using the iPad for students with dyscalculia is considered one of the modern studies. Many people who work in special education have high expectations that may contribute to dealing with students weaknesses, which will help improve the abilities of those with learning difficulties (Al-Dhifairi, 2000; Poobrasert, 2013; Bou et al., 2016).

Technology has an important role in the different fields of science. (Nuzhnaya et al., 2019; Zahra and Alanazi 2019) Therefore, It is well known that computer skills are one of the most important skills that a child should be good at because they are associated with positive aspects such as organization, precision, objectivity, hard work, and scientific thinking (Drigas et al., 2016).

Research Problem

Dyscalculia is considered to be a cognitive disorder that hinders arithmetic performance even when the mental ability is normal (Jovanović et al., 2013). It is a disability that rises with early childhood, being connected with problems at arithmetic and counting abilities. Statistics show that dyscalculia represents 6% of the world's population (Geary, 2011). Also, Geary (2011), and Pappas & Driga (2015) found that the percentage of dyscalculia among students reaches up to 7%, while in the Arab World, as Bihairi (2008) shows, in the fourth form, reaches up to 11.04%, 22.7% in fifth, and 28% in sixth.

Researchers have observed that through surfing the literature of the field of educational technology, the use of these technologies has helped to reduce and treat many learning difficulties. With iPads in education increasingly being utilized since their implementation in 2010, the pedagogical efficiency of this device should be examined (Kaur et al., 2017). Therefore, recent developments in technology have resulted in products like the iPad in Education and rehabilitation programs involving persons with developmental disabilities appear to be underway (Chambers et al. 2018)

In addition, many educationally oriented applications are now available for use in conjunction with the iPad. Which motivated see the researchers to design many training sessions based on some iPad applications (Karsentl and fievez, 2013; Nagavalli and Fidelis, 2015; Pappas and Drigas, 2015). Therefore, the problem of research can be stated in the following question:

What is the impact of using iPad applications on the treatment of developmental dyscalculia with a sample of students with learning disabilities in Rafha Province, Kingdom of Saudi Arabia?

Research Objectives

This research aims to achieve the following goals:

- Find out how iPad applications affect the treatment of dyscalculia among children in the Rafha Province, Kingdom of Saudi Arabia.
- To discover the differences between the experimental and control groups in the post-test.
- To find out the degree to which children interact with the applications.

The terminology of the Research

-Dyscalculia: this is a disorder related to a weakness in learning basic arithmetic facts, the treatment of numerical values, and the performance of precise calculations. These weaknesses should be less than an anticipated degree for the individual's time age, and not resulting from the lack of good daily educational activities or mental disabilities (British Dyslexia Association, 2017).

Program: The term is defined by the researcher as follows: the researcher used three iPad applications, "Garden of Numbers," Learn Numbers," and "Learn Math." The rationale behind this choice is to meet their goals and recommendations for those with learning difficulties by the Ministry of Education, KSA, and because they are dealing with their age intending to recognize and memorize mathematical symbols such as addition, subtraction, multiplication, and division, as well as reading numbers that consist of more than one digit by reversing their sides in reading, writing, or understanding the values of the place of the numbers and writing them accordingly (Researcher).



Theoretical Framework and Previous Studies

Learning disabilities

Kirk, 1963 is considered to be the first to use the term "learning disabilities" as an educational terminology, stating that they are normal students but unable to compete with their peers in the same learning circumstances due to a disorder in one or more of the basic psychological processes relating to the understanding or use of the language: speaking, writing or performing mathematical operations (see Lashhab, 2015; Al-Bablawi and Ahmed, 2002; Lyon et al., 2001). These disabilities can be a development, which has to do with attention, memory, conceptual understanding, and problem-solving. In school subjects, it may also be academically-related (A'das, 2002; Hafiz, 2008).

Dyscalculia

Dyscalculia is a learning disability related to the weakness of learning arithmetic basic facts, the treatment of numerical values, and the performance of precise calculations. These weaknesses should be less than an anticipated degree for the individual's time age, and not resulting from the lack of good daily educational activities or mental disabilities (British Dyslexia Association, 2017).

For example, dyscalculia is associated with a problem in cognitive processes, attention which appears in the mistakes in memorizing or repeating, realizing, which appears as the inability to distinguish between shapes, volumes, distances, written and spoken words, a memory which varies according to the type of memory whether short or long- term, and transition from explicit to implicit thinking (Adas, 2002).

Causes of dyscalculia can be personal, including brain injuries that affect all mental skills, IQ rates, and associated skills such as numerals, places, and geometric skills (Hafiz, 2008). These may have triggered mathematics' adverse attitude (Nagavalli, 2015). In addition, environmental reasons, which include factors related to the school and the home environments (Al-Sayegh et al., 2014).

Assessment of arithmetic capabilities may be performed through numerical exams, such as quantitative comparison tests, which include comparing spoken, written numbers and figures. Transformation and coding tests that include changing numbers into figures, writing numbers into spoken numbers, spoken numbers into written numbers and spoken numbers (Sulaiman et al., 2007; Calia, 2013).

In addition, through mathematical tests, which include tests for understanding the symbols and words of a mathematical operation, when, for example, we give a child $(4 + 9)$, $(2-5)$, (3×4) , or $(12-4)$ and ask him/her to indicate the name of the operation: addition, subtraction, multiplication, or division (Piazza, 2014).

IPad application for students with dyscalculia

Beginning in 1988, assistive technologies have been developed for students with special needs by the U. S. with special needs technology laws.

It was intended to guarantee that the necessary technology reaches the workplaces, homes, and society for the rehabilitation of individuals with disabilities following the disability education act (IDEA) and the implementation of technology, which is regarded to be a key component of instructional planning for students with special needs (Simsek 2016). Mutlu and Akgün



(2017) show that the mathematical skills of the samples have developed and there was a significant increase in the speed of their response.

The iPad is a portable, inexpensive, accessible, easy-to-use, multi-sensor mobile device (unlike a laptop or desktop computer), that can be adapted to individual learning requirements of the learners by adding apps (Kagohara et al. 2013).

In all grades and for learners who have a range of special needs for various learning reasons like social, academic, communicative and functional, iPads are used constructively across respondents and nations (Chambers et al., 2018). Al-Yami and Abdul-Aziz (2018) show the efficiency of a computer program based on autonomous learning, using the iPad to improve language skills for third form students with mild mental disability in Al-Ihsa, KSA. The results of the study showed that there were no difference in language skills among the individuals of the experimental group before and after the application for the post-test, and between the experimental and control groups after the application for the experimental group, as well as the absence of difference between the experimental group in the pre and post-tests.

Karsent and Fievez (2013) mention a group of uses of iPad applications in education as follows: facilitating access, managing, and sharing information, promotion of the students' learning and performance, allowance of the use of a group of training strategies, promotion of individual learning, improving reading, encouraging the interaction and cooperation between students and teachers, the facilitation of the assessment of the child, the improvement of the quality of educational support, facilitating learning how to write, offering live and various media, and benefiting from the services provided to the students with learning problems.

Al-Ajmi (2016) analyzes the efficiency of using the educational application (Nan and Layla) on iPad in teaching the alphabet to students with a mental disability, depending on the popular Characteristics of Nan and Layla in the kids' channel of "barai'm.", the results showed the effectiveness of using the educational application Nan and Layla on the iPad in teaching the alphabet to students with mental disability.

Al-Qudsi and Jaradat (2014) aimed to examine the effect of using the iPad on the quality of teaching of private-school teachers from their point of view, in addition to the difficulties that teachers may encounter in their teaching with the use of the iPad. The results showed that there was a tendency to use the iPad in teaching, but on the other hand, the results showed no statistically significant differences between special education teachers in using iPad in teaching.

Poobrasert and Gestubtim (2013) aim to provide students with learning difficulties to develop a project on assistive technology development. The project succeeded in preparing computer programs such as the program of prediction and other Thai words search, by supporting students with learning difficulties in writing and mathematics in students with learning difficulties in Thailand. The results show that the program is effective in improving basic mathematics and reading skills.

Kagohara et al. (2013) confirmed that the results of the 15 studies have been largely positive, indicating that iPods1, iPod Touch1, iPads, and related devices are viable technological aids for individuals with developmental disabilities. Since iPads have been increasingly used in education since their implementation in 2010, the pedagogical efficiency of this device should be examined (Kaur et al., 2017).



Hypotheses

- This study aimed to test the following hypotheses:
- There are statistically significant differences between the two average scores in the dyscalculia questionnaire for the experimental and control groups in the post-test.
- There are statistically significant differences between the two average scores in the dyscalculia questionnaire for the experimental group at the pre and posttests.
- There are no statistically significant differences between the two averages in the dyscalculia questionnaire for the control group at pre and post-tests.
- There are no statistically significant differences between the two average scores in the dyscalculia questionnaire for the experimental group at the pre and post-tests after the passage of two months from the post-test.

RESEARCH METHODOLOGY

Data collection and sampling

The final sample of the study was made up of 38 students of 60 students from 4 schools in Rafha province during the academic year 2017/2018. Students were nominated by their teachers and the study tools were implemented to select the sample and determine 100 and above as the intelligence degree, average age, score above the 15th percentile score in the Dyscalculia rating scale groups, so the sample was allocated on equal terms of age, intelligence, sample rating scale. Then, the study sample was divided into two equal groups: the experimental group and the control group, 19 in each group of students, the sample was chosen randomly from the schools. Table 1 demonstrates the experimental and control group characteristics.

Table 1. Test and control group characteristics

Table 1. Experimental and control group Characteristics

	Group	N	Medium	Standard Deviation	mean rank	Sum of ranks	U Value	Z Value	Sig
Age	Experimental	19	9.600	1.578	18.63	354.0	164.0	.50	No
	Control	19	9.778	1.642	20.37	378.0			
Intelligence	Experimental	19	104.9	3.315	19.55	371.5	179.5	0.07	No
	Control	19	105.0	3.571	19.45	369.5			
Dyscalculia	Experimental	19	295.7	22.598	20.79	395.0	156.0	.72	No
	Control	19	294.33	25.986	18.21	346.0			

Table 1 shows the characteristics of the experimental group (N=19), the control group (N=19). There was no significant difference between the experimental and control group students in terms of age, intelligence, a score above the 15th percentile score on the Dyscalculia rating scale.

Study Tools

- Diagnostic assessment battery for learning difficulties (Al- Zayyat, 2007): The diagnostic assessment battery for learning difficulties was prepared and used to discover and diagnose



cases of learning difficulties for students from the third form of primary school to the third form of elementary school. These are constant and integer assessment tests from the standard reference. They consist of nine independent tests, five of which involve the problems of cognitive operations: attention, visual recognition, audio recognition, motive recognition, and memory, three of tests involve the academic learning difficulties in reading, writing, and mathematics, and the remaining test involves the problems of interaction and social behavior. Each test consists of 20 items describing different forms of behavior related to the learning difficulties in a specific field. Those in charge of the test should read each item and determine the degree of the application of behavioral content prescribed by the item on the subject of the test (always =4 at high frequency, rarely =1). The items of each test were selected according to the behavioral features shown in the results of theoretical research about the special qualitative learning difficulties, which were evaluated and had their validity checked by prominent referees in the field of learning difficulties, as well as the appropriate statistical analysis of the items. These evaluations are used to find out, in a quantitative framework, about the forms of the individual behavior concerning the nine aspects measured by these tests. These quantitative data were transferred to standard degrees and percentages obtained with appropriate statistical processors. This has been considered as a test of high validity and reliability (see Al- Zayyat, 2007).

Then, simple instructions were put in place, where teachers would respond to each item of the draft items. Subsequently, responses are given weightings on a 4-point Likert scale, as follows: Always (4), Sometimes (3), rarely (2), Never (1), where (20) represents is the minimum degree to be scored by a student on the whole scale, while (80) represents the maximum degree to be scored by a student on the same scale. It measures the skills in counting, ascending and descending skills, using the symbols 'greater than' and 'less than', to measure the distinction between the symbols of (+), (-), (\times), and (\div), the transformation of verbal problems to mathematical formulas, reading the numbers that consist of two digits, understanding the place values of numbers and writing them accordingly.

Validity is calculated by calculating the correlation between the degree of every single item and the dimension to which it belongs. All correlation coefficient values were proved positive and indicative. They ranged from 0.76 to 0.18. In addition, the correlation coefficient values of the total score for each ranged between 0.615 to 0.87. All of these values are significant at 0.01. This makes us believe in the validity of the final scale. The reliability equation is computed through alpha, resulting in the calculation of stability (0.79), along with the calculation of Guttman indivisible split-half technique. All items of the scale were proved to range from 0.701 to 0.880, all of which represent values at 0.01. This confirms the stability of the final list.

-Raven's Color Progressive Matrices test: This is one of the progressive matrices prepared by the psychologist John Raven in (1938). this is considered as a test of non-verbal intelligence, which is not affected by any culture and depends on the application of the group but can also be applied individually. It consists of three sections: A, AB, and B, each containing 12 items. It was prepared to formulate the details of the mental processes for the students aged five years and a half to eleven. Each of the matrix items consists of a basic shape with a part that has been cut of it, with six parts below, of which the subject has to choose the one that completes the shape. Colors have been used as background for puzzles to make the test more interesting and



exciting for students' attention. The problem of part A depends on the ability of the subject to complete the progressive shapes, and shift towards the end of the group, the progressive shape changes to have two dimensions at the same time. The subject's success in part AB depends on the individual's ability to recognize separate shapes in a whole one, based on the relation of Space.

In part B, the solution of the problems depends on understanding the rule that controls variables logically or spatially connected shapes, which require the individual's ability to abstract thinking. The late problems in part B are considered as of the same level of difficulty as that of the normal progressive matrices test. It is also considered as a test of high integrity and constancy.

Current Program Description

The following is a description of the procedures and steps followed by the researcher to achieve the main objective of the research.

After gaining the principal consent, the agreement had been reached on all program information, amount of meetings, and relevant tasks needed with the school administrative boards. Then there was a room with several iPads. Special approvals were acquired, throughout its session, from the parents of the learners of the sample.

Content: The researcher has used three iPad applications from the program of Garden of numbers, learn numbers, and Learn math because they met the aims and recommendations to those with learning difficulties, by the Ministry of Education, the kingdom of Saudi Arabia, and dealing with them age. These programs work together to develop a group of mathematical skills for children with learning difficulties, each one contains many activities. Table 2 is a distribution of the teaching plan for the program.



Table 2. Distribution of program teaching plan

Lesson	Topic	IPad applications	No. of Sessions
First	Memorizing the Counting with the correct order.	Garden of Numbers	3
Second	Attention to ascending and descending order.	Learn Numbers	3
Third	Understanding mathematical operations (addition, subtraction, multiplication, division).	Learn Math	3
Fourth	Using the symbols of 'greater than' and 'less than'.	Garden of Numbers	4
Fifth	The distinction between the symbols of (+), (-), (\times), and (\div).	Learn Math	4
Sixth	Transforming verbal problems into mathematical formulas.	Learn Math	4
Seventh	Reading the numbers that consist of two digits.	Learn Math	3
Eighth	Understanding the place values of numbers and writing them accordingly.	Learn Math	4
Total			28

Program Strategies Applied

- Warming up: where the goal of the teaching method is explained and the lesson relates to

past experiences.

- Modeling: The teacher gives a model for mental procedures that solves mathematical issues and offers many fresh and different alternatives.
- Reinforcement: Teacher involvement with a student: this step is made when the instructor feels that the modeling and observation method is difficult.
- Homework: Every student does exercises that he does at home for a different number of mathematics.
- Assessment: When the teacher asks a question to assess the student's performance and determine the strengths and weaknesses.

Study Application Procedures

- Following these steps, the scientists completed the preparation of their iPad products and the provision of research instruments in their final forms:
- Appointment of primary schools that choose the sample.
- Raven's Colored Progressive Matrices Test, the diagnostic evaluation battery of learning difficulties, and the Dyscalculia rating scale were performed on the four elementary schools in the province of Rafha after their teacher nominees were appointed.
- Randomly divide students into two groups: experimental and control (see table 3).
- Before implementing the program, the experimental and control samples were pre-tested using the dyscalculia rating scale as a key instrument for the research.
- The iPad apps were implemented. The time allocated for each session was 28 and 45 minutes. Four sessions were held a week.
- The experimental and control post-test was carried out on the topics of the samples of the two groups immediately after the iPad program was finalized by re-applying the Dyscalculia rating scale.
- Carrying out suitable statistical procedures to investigate the hypotheses of the study.

The study design

- Design: This research has two variables, a semi-experimental: an independent variable and a dependent one. Pre/post/ follow-up tests have been followed by a layout of the control and experimental groups: see Table 3.

Table 3. The study design

The group	Pretest	procedure	Post-test	Follow up test
Experimental	Dyscalculia rating scale	Teaching by iPad products	Dyscalculia rating scale	Dyscalculia rating scale
Control	Dyscalculia rating scale	Teaching by using the traditional method	Dyscalculia rating scale	

Study variables: the current study consisted of the following variables:

- Independent variable: the program.
- Dependent variable: Reducing dyscalculia.

Results were analyzed using the equivalence groups method to determine the effect of the independent variable on the dependent variable. In this research a group of statistical methods have been used to analyze the results:

Correlation, medians, means and standard deviation

T-test for finding significant differences between means

STUDY RESULTS

Hypothesis 1:

-There were statistically significant differences between the two average scores in the dyscalculia questionnaire for the experimental and control groups in the post-test.

To test the validity of this hypothesis, the two groups were compared through the T-test to compare the experimental and control groups.

Table 4. Difference between the experimental and control groups in the post-test

Tool	Group	No	Mean	Standard Deviation	Degree of Freedom	T Value	Significance Level
Dyscalculia Rating Scale	Experimental	19	32.31	2.35	36	37.36	0.00
	Control	19	70.57	3.79			

Table 4 shows statistically significant differences at (0.1) between the experimental and control groups at post-test.

Hypothesis 2:

- There were statistically significant differences between the two average scores in the dyscalculia questionnaire for the experimental group at the pre and posttests.

To test the validity of this hypothesis, the T-test was used to compare pre and post-test for the experimental group. Table 5 summarizes the results.

Table 5. Difference between pre and post-test of the experimental group

Tool	Group	No	Mean	Standard Deviation	Degree of Freedom	T Value	Significance Level
Dyscalculia Rating Scale	Pre	19	79.21	3.61	18	84.6 59.7	0.00
	post	19	32.31	2.35			

Table 5 shows the statistically significant differences at (0.1) for the experimental group in the dyscalculia questionnaire, which indicates the rejection of the zero hypotheses and adopting an alternative option: the existence of statistically significant differences at (0.1) for the experimental group.

Hypothesis 3:

- There were no statistically significant differences between the two averages in the dyscalculia questionnaire for the control group at the pre and posttests.



To test the validity of this hypothesis, the T-test was used to compare pre and post-test.

Table 6. Differences between pre and post-test of the control group

Tool	Group	No	Mean	Standard Deviation	Degree of Freedom	T Value	Significance Level
Dyscalculia Rating Scale	Pre	19	70.21	3.61	18	.75	0.5
	Post	19	69.52	11.9			

Table 6 shows the absence of statistically significant differences between pre and post-test and follow-up tests for the control group on the evaluation of dyscalculia, indicating a rejection of the zero hypotheses.

Hypothesis 4:

-There were no statistically significant differences between the two averages in the dyscalculia questionnaire for the experimental group at the pre and posttests after the passage of two months from the post-test.

To test the validity of this hypothesis, the T-test was used to compare the pre and post-test.

Table 7. Differences between post and follow-up tests for the experimental group in the assessment of dyscalculia

Tool	Group	No	Mean	Standard Deviation	Degree of Freedom	T Value	Significance Level
Dyscalculia Rating Scale	Post	19	31.26	1.9	18	1.5	0.14
	Follow	19	32.3	2.35			

TABLE 7 Shows the absence of statistically significant differences between the post-test and the follow-up test for the control group in dyscalculia evaluation, indicating acceptance of the null hypothesis.

Figure 1 shows the degree of the difference between the results of the pre, post and follow-up tests results for the experimental group, where there was an improvement in experimental group performance between the pre and post-test, as well as the stability of the effect of group learning on the performance of the experimental group two months after the application of the experimental program.

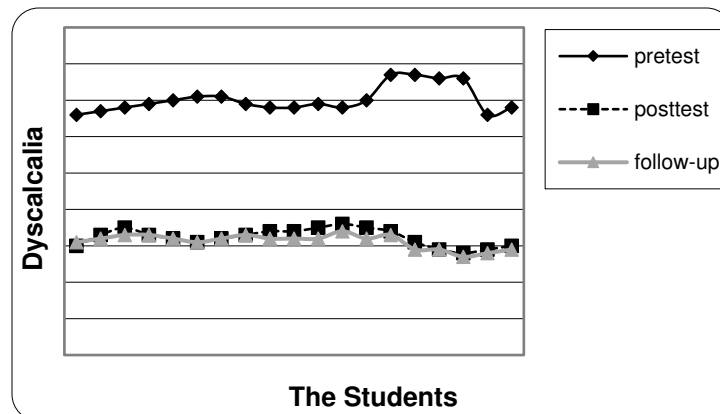


Figure 1. The differences between the results of the pre, post, and follow-up tests for the experimental group

DISCUSSION

By assessing previous literature, this research expands the efficiency of iPad applications in the treatment of dyscalculia with the students of learning difficulties in Rafha Province, KSA, through discovering the differences between the experimental control groups at the post-tests, in addition to the assessment of the sample's interaction with the applications. These impacts can be explained in many ways. First: Table 1. Shows the characteristic of The students before performing the program was mentioned by nominating them in terms of intelligence degree, average age, a score above the 15th percentile score on dyscalculia rating scale groups so, the sample was allocated on equal terms of age, intelligence, rating scale the sample. As the literature has shown, the characteristics of the study, which is Dyscalculia is a learning disability related to poor learning of basic arithmetic facts, numerical values treatment, and the performance of precise calculations.

These weaknesses must should less than anticipated degree for the individual's time age, and not resulting from the lack of good daily educational activities or mental disabilities (British Dyslexia Association 2017). They also formulate information slower than their peers of the same age; they use ways of formulation of the information that does not allow them to use their mental capacities because they cannot achieve supposed success (Adas 2002; Hafiz 2008).

Second, Table 2. Shows the distribution of the teaching plan for the program, Sessions were held on relevant abilities and trends of each kid using the apps of Garden Numbers, Learn Numbers apps and The Learn Mathematics app. This was because the Ministry of Education's goals and suggestions were met., for those with learning difficulties, and those dealing with learning difficulties. It also considered the gradual and varied nature of the program to fit the child's capacity as interpretation learning difficulties that support the results of the current study (Hafiz, 2008; Al-Faouri, 2010; Al-Ajami and Abdul Hadi, 2016; Abu Hadid, 2017).

Third, the efficiency of this program can be explained because the research follows a semi-experimental design. Quasi-experimental research eliminates the problem of directionality. However, because participants are not randomly assigned— making it likely that there are other differences between conditions— quasi-experimental research does not eliminate the problem of confounding variables. In the case of internal validity is concerned, therefore, quasi-experiments are generally somewhere between correlation studies and true experiments (Cook and Campbell, 1979). Table 3 shows the study design because this research has two variables, one independent variable and one dependent one.

Forth, it is also possible to interpret the results in light of what has been emphasized in previous studies of using the iPad as an efficient tool in the treatment of learning difficulties, such as Al-Qudsi and Jaradat (2014), Al-Utaibi, (2014), and Al-Zaid and Al-Mashaqba (2015). The iPad is a fresh and fascinating technology with diverse roles and the ability to improve education. The iPad provides additional practice possibilities with interactive education applications for learners (Kaur et al., 2017). Many researchers emphasize the importance of the iPad in education (See Al-Ajmi, 2016), where research has shown that it is effective in promoting educational processes, particularly with learning difficulties, to Al-Yami and Abdul-Aziz (2018), Mutlu and Akgün (2017), Qunaibi (2016), Al-Ajmi (2016) Karsentl and fievez (2013), and Al-Qudsi and Jaradat (2014). The iPad enables the user to control through a multi-touch feature that teaches to add, subtract, multiply, divide, squares, cubes of



students (Nagavalli and Juliet, 2015). Tables 4 to 7 illustrate the differences between the results of pre, post, and follow-up tests

Fifth, Figure 1. Shows The differences between the results of pre, post, and follow-up tests for the experimental group, the efficiency can be explained because the program includes methods, techniques, and procedures, which can stimulate the various abilities of the child and activate his role. One example is 'reinforcement', which motivates the child to accomplish her duties and correct negative behavior (Al-Faouri, 2010). The researcher observes that each child has different reinforcements than others; therefore, this study provided a wish list for each child's reinforcement. When the child receives the desired reinforcement, this leads to an increase in motivation. There are various reinforcements, but the most popular are those which contain the involvement in the social activities that he loves, such as playing and story-telling, which the child needs at that life stage as they are featured by hurriedness, and lack of attention (Al- Zayyat, 2007).

The homework technique has helped to evaluate the performance of the program. at each session, the child was required to carry out some activities that help achieve the goal and, on the other hand, maintain its effect (Lyon et al., 2001).

The researcher showed that several factors led to the achievement of the program goals, such as the educational environment which was carefully prepared for the sessions, as well as various visual and audio stimulants that help achieve the child's right response (Abu Hadid, 2017). Individual differences were also considered through the division of the sessions into three graded levels according to their difficulty to fit each child's abilities (Sulaiman et al., 2007).

The results are in agreement with what has been presented by previous literature review and studies, such as (Quonaibi, 2016; Al-Yami and Abdulaziz, 2018). Previous studies and the theoretical framework have also emphasized the benefit of students to the programs provided to them, especially in the treatment of dyscalculia, such as (Poobrasert and Gestubtim, 2013; De Castro et al., 2014; Stacy et al., 2017; Mutlu and Akgün, 2017).

CONCLUSION

In conclusion, in this study, I explored the efficiency of this program in the treatment of developmental dyscalculia using the iPad, in which sessions included many exercises and activities aimed at recognizing and using mathematical symbols such as addition, subtraction, multiplication, and division, as well as reading the numbers which consist of more than one digit by reversing their sides in reading, writing, or problems concerning the copying of geometric shapes from the board, book, or pictures.

General recommendations

- To study the most important obstacles to using the iPad in the treatment of dyscalculia.
- To guide parents to efficient methods to train their students, especially if they have a hyperactivity disorder.
- Immediate interference to detect developmental dyscalculia with students.



Suggestions for further research

For further research on the current topic, the researcher suggests the following study:

-The efficiency of a program, which is based on some iPad applications to reduce childhood developmental dyscalculia.

Conflict of interest

The researcher has no conflict of interest.

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